

PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION  
International Bureau

## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification <sup>6</sup> : <b>H01R 13/52, 4/70, 4/24</b></p>	<p><b>A1</b></p>	<p>(11) International Publication Number: <b>WO 97/07565</b></p> <p>(43) International Publication Date: 27 February 1997 (27.02.97)</p>
<p>(21) International Application Number: PCT/US96/13380</p> <p>(22) International Filing Date: 19 August 1996 (19.08.96)</p> <p>(30) Priority Data: 95 1 16580.6 18 August 1995 (18.08.95) CN</p> <p>(71) Applicant (for all designated States except US): THE WHITAKER CORPORATION [US/US]; Suite 450, 4550 New Linden Hill Road, Wilmington, DE 19808 (US).</p> <p>(72) Inventors; and (75) Inventors/Applicants (for US only): TOY, Lester [CN/CN]; AMP Shangai Ltd., 668 Guiping Road, Shangai 200233 (CN). ZHAI, Gary [CN/CN]; AMP Shangai Ltd., 668 Guiping Road, Shangai 200233 (CN). QU, James [CN/CN]; AMP Shangai Ltd., 668 Guiping Road, Shangai 200233 (CN).</p> <p>(74) Agents: GROEN, Eric, J. et al.; The Whitaker Corporation, Suite 450, 4550 New Linden Hill Road, Wilmington, DE 19808 (US).</p>		<p>(81) Designated States: AU, JP, KR, SG, US, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).</p> <p>Published With international search report.</p>
<p>(54) Title: SEALED ELECTRICAL CONNECTOR</p> <p>(57) Abstract</p> <p>The invention provides a presealed, less expensive and easy to handle sealed electrical connector particularly suited for telephone application. The sealed electrical connector (10) comprises a connector subassembly including a connector body (20) coated with adhesive sealing material (30) sandwiched between plastic films (40).</p> <div data-bbox="779 1134 1315 1953"> </div>		

**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AM	Armenia	GB	United Kingdom	MW	Malawi
AT	Austria	GE	Georgia	MX	Mexico
AU	Australia	GN	Guinea	NE	Niger
BB	Barbados	GR	Greece	NL	Netherlands
BE	Belgium	HU	Hungary	NO	Norway
BF	Burkina Faso	IE	Ireland	NZ	New Zealand
BG	Bulgaria	IT	Italy	PL	Poland
BJ	Benin	JP	Japan	PT	Portugal
BR	Brazil	KE	Kenya	RO	Romania
BY	Belarus	KG	Kyrgyzstan	RU	Russian Federation
CA	Canada	KP	Democratic People's Republic of Korea	SD	Sudan
CF	Central African Republic	KR	Republic of Korea	SE	Sweden
CG	Congo	KZ	Kazakhstan	SG	Singapore
CH	Switzerland	LI	Liechtenstein	SI	Slovenia
CI	Côte d'Ivoire	LK	Sri Lanka	SK	Slovakia
CM	Cameroon	LR	Liberia	SN	Senegal
CN	China	LT	Lithuania	SZ	Swaziland
CS	Czechoslovakia	LU	Luxembourg	TD	Chad
CZ	Czech Republic	LV	Latvia	TG	Togo
DE	Germany	MC	Monaco	TJ	Tajikistan
DK	Denmark	MD	Republic of Moldova	TT	Trinidad and Tobago
EE	Estonia	MG	Madagascar	UA	Ukraine
ES	Spain	ML	Mali	UG	Uganda
FI	Finland	MN	Mongolia	US	United States of America
FR	France	MR	Mauritania	UZ	Uzbekistan
GA	Gabon			VN	Viet Nam

## **SPECIFICATION**

### **TITLE OF INVENTION**

Sealed Electrical Connector

### **DETAILED DESCRIPTION OF INVENTION**

The present invention relates generally to an electrical connector, more specifically to a sealed electrical connector.

#### **(Prior Art)**

Some electrical connectors are used in a field such as connectors for telecommunication or telephone applications. Such electrical connectors have typically a large number of contacts for interconnecting a large number of electrical wires from a multi-conductor telephone cable.

Such field use or outside plant electrical connectors are exposed to environment, e.g., high and low temperature and high humidity. Sometimes they are exposed to raindrops. Such telephone connectors introduce noise due to crosstalk or leakage between adjacent contacts or electrical wires terminated thereto, especially when exposed to high humidity or water. As a result, it is desirable or required to employ sealed electrical connectors for such applications.

Water-tight or humidity protected electrical connectors which are commonly known as sealed connectors have widely been used over many years. One typical example of such sealed connectors is disclosed in U.S. patent no. 3,897,129 issued on July 29, 1975. Such conventional sealed connector is encapsulated or accommodated in a case filled with a predetermined quantity of viscous dielectric material. In other words, a connector housing having a plurality of contact terminals inserted into terminal receiving passageways and terminated to respective electrical wires is inserted into such case, thereby allowing the viscous dielectric material to spread over the connector. The viscous dielectric material helps to keep water or moisture away from the contact terminals.

Unfortunately, however, such conventional sealed connector is bulky because the connector terminated to electrical wires must be inserted into a case filled with a viscous dielectric material or sealant. Other disadvantages include difficulty in handling especially in the field and also expensive. Also, it is not easy to maintain the viscous dielectric material in position and effectively seal the connector over a long period of time.

It is therefore an object of the present invention to provide an improved sealed electrical connector which is simpler in construction, easier in handling, less expensive and better performance than conventional connectors.

The sealed electrical connector according to the present invention is a type having contacts on the outer surface of the housing for termination to respective electrical wires. It features the application of sealing material such as gel on the outer surfaces of the connector housing. Normally, plastic film is applied on both main surfaces of the housing for ease of handling of the connector and preventing dust or any foreign materials from attaching the sealing material. Termination of electrical wires onto contact terminals is carried out by removing the plastic film, preferably by using stuffer covers. The inherent property of the sealing material or sealing gel fills any trace of the electrical wires and the contacts, thereby maintaining good sealing characteristic of the electrical connector.

Now, preferred examples of the sealed electrical connector according to the present invention will be described hereunder by reference to the accompanying drawings.

FIG. 1 is an exploded perspective view of one preferred embodiment of the sealed electrical connector according to the present invention.

FIG. 2 is a magnified partial plan view of the connector housing in FIG. 1.

FIG. 3 is a perspective view of the sealed electrical connector terminated to electrical wires.

FIG. 4 is a partial side view of the sealed electrical connector in FIG. 3.

Illustrated in FIG. 1 is an exploded perspective view of one embodiment of the sealed electrical connector according to the present invention. The sealed electrical connector 10 in this particular embodiment may be an IDC type stackable connector, e.g., so-called AMPSTACK-III connector commercially available from AMP Incorporated in Pennsylvania, USA. AMPSTACK is a trademark of The Whitaker Corporation, a subsidiary of AMP Incorporated.

The sealed electrical connector 10 comprises a connector body 20, a pair of plastic films 40a, 40b and a pair of covers or stuffers 50a, 50b. Preferably, the connector body 20 includes a pair of stackable plate-like housings 21 and a plurality of IDC (insulation displacing) contacts or terminals 22 received in a plurality of contact receiving cavities in the housings 21. A plurality of wire receiving channels 24 are formed in parallel with one another on both outer surfaces of the housing 21 for proper alignment or guidance of ends of electrical wires to be proper alignment or guidance of ends of electrical wires to be terminated to the contacts 22 disposed in alignment with the channels 24. A part of the housing 21 is shown in magnified scale in FIG. 2. It is preferable that each contact 22 has an IDC slot 25 and a cutting blade 26 disposed at a certain space therebetween. The IDC slot 25 and the cutting blade 26 may be an integral part or separate parts. As a best shown in FIG. 2, the channels 24 and the contacts 22 are disposed in a staggered manner for high density and ease of assembly.

In practice, the connector body 20 is coated with an appropriate sealing material (sealing gel composition) 30 on the outer surfaces and sandwiched with a pair of plastic films 40a, 40b on both surfaces of the connector body 20 for sealing or presealing the connector 10. The connector body 20, presealed by the sealing material 30 and sandwiched by the plastic films 40a, 40b constitute a connector subassembly.

Preferably, the sealing material 30 is a transparent gel with sufficient adhesive characteristic to adhere to the housing 21, the contacts 22, and the plastic films 40. Also, the sealing material 30 has certain conformability for better sealing the electrical wires terminated to the contacts 22 as described hereinafter. Preferably, it has a cone penetration of at least about 50 ( $10^{-1}$  mm) and ultimate elongation of at least about 200%.

The plastic film 40 may be polyethylene or any other plastic material having sufficient adherence with the sealing material 30 but relatively easily peelable from the sealing material 30 if necessary for termination of the electrical wires to the contacts 22. Also, the plastic films 40a, 40b have sufficient width to cover both main surfaces of the connector body 20.

For application of the sealed electrical connector 10 or to terminate electrical wires from, for example, a telephone cable, the ends of the electrical wires 100 to be terminated are aligned and placed in the selected channels (not shown) in the cover 50b. After removing or peeling off one plastic film 40b from the surface of the sealed electrical connector body 20, the connector body 20 is placed over the electrical wires 100 on the cover 50b. Then, another plastic film 40 is removed or peeled off and the ends of the electrical wires 100 to be terminated are aligned and placed in the selected channels 24 of the connector body 20. After placing the top cover 50a in alignment with the connector body 20 over the electrical wires on the connector body 20, pressure is applied to both covers 50a, 50b toward each other by a tool or a so-called applicator for insulation displacing or terminating the electrical wires 100 to the IDC slots 25 of the respective contacts 22 in the connector body 20.

FIG. 3 illustrates the sealed electrical connector 10 terminated to electrical wires 100. As apparent from the above descriptions, the sealing material 30 covers the entire surface of the finally assembled connector 10, thereby providing sufficient sealing to moisture, dust, etc. and protecting noise due to leakage of electrical current between adjacent contacts. Note that pressure applied to the cover 50 during termination will also help to close any gap of the sealing material 30 between electrically conductive members, i.e., the contacts 22 and conductors of the electrical wires.

Illustrated in FIG. 4 is a magnified partial side view of the sealed electrical connector 10 terminated to the electrical wires 100. It should be noted that the connector housing 21 is covered with the sealing material 30, thereby maintaining good sealing property of the connector 10 over a long period of time regardless of severe environmental conditions by proper choice of the sealing material 30. One typical example of the sealing material 30 is disclosed in U.S. patent no. 5,360,350 assigned to The Whitaker Corporation.

As understood from the above description, the sealed electrical connector according to the present invention features the use of the presealed connector subassembly. Despite of the use of sticky sealing material on the surface of the connector housing, the plastic films 40 prevent dust and any foreign materials to attach the surface and maintain ease of handling of the sealed electrical connector.

In the particular embodiment mentioned above, a pair of plastic films 40a, 40b are used. However, a single plastic film may be used to wrap the connector body at both surfaces. Also, if a thin transparent plastic film is used, such film may not be removed for termination as long as the contacts are sharp enough to break the film during termination. The plastic film may be replaced by a plastic coated paper or other film which is adhesive to but peelable from the sealing gel composition.

As apparent from the above description and illustrations in the accompanying drawings, the sealed electrical connector according to the present invention is presealed to provide improved quality of signals to be connected by the connector and maintain ease of handling of the connector during stock, transportation and assembling.

**CLAIM FOR PATENT**

- (1) A sealed electrical connector having a plurality of electrical contacts exposed on the surface of an insulating housing for terminating electrical wires,

characterized in that sealing gel composition is attached to the surface of said insulating housing and a film is attached on the outer surface of said sealing gel composition.

- (2) A sealed electrical connector of claim 1, wherein said gel composition has a cone penetration of at least about 50 ( $10^{-1}$  mm) and ultimate elongation of at least about 200%.
- (3) A sealed electrical connector of claim 1 wherein said film is made from a thin plastic film or a plastic coated paper.
- (4) A sealed electrical connector of claim 1, wherein said sealing gel composition is adhesive and said film is peelable from said sealing gel composition.
- (5) A sealed electrical connector of claim 1, wherein said contacts are insulation displacement contacts each having insulation displacement slots extending from both surfaces of said insulating housing.
- (6) A sealed electrical connector of claim 4, wherein said insulating housing comprises a pair of halves to be intercoupled in a stacked manner by said insulation displacement contacts.



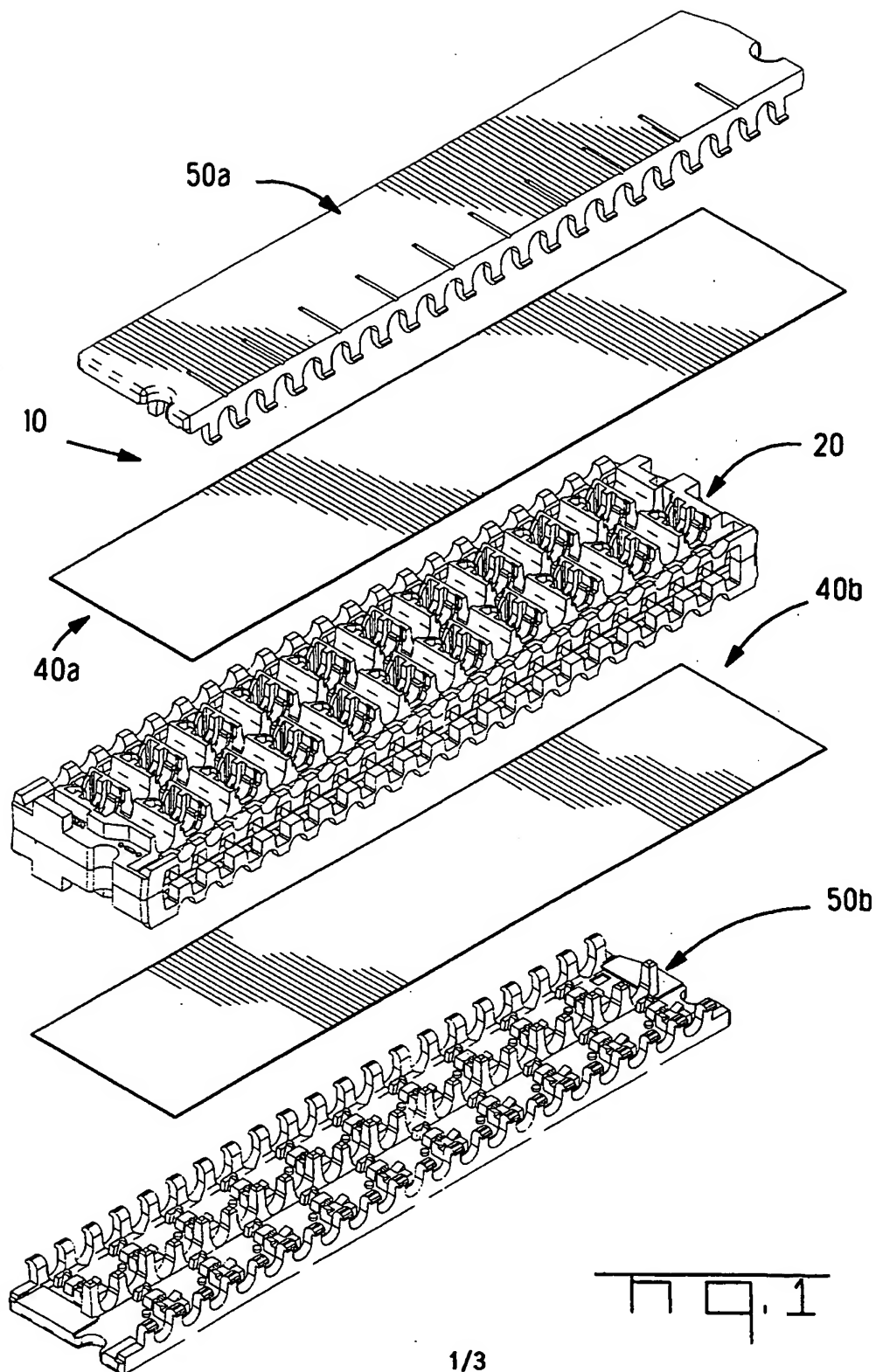
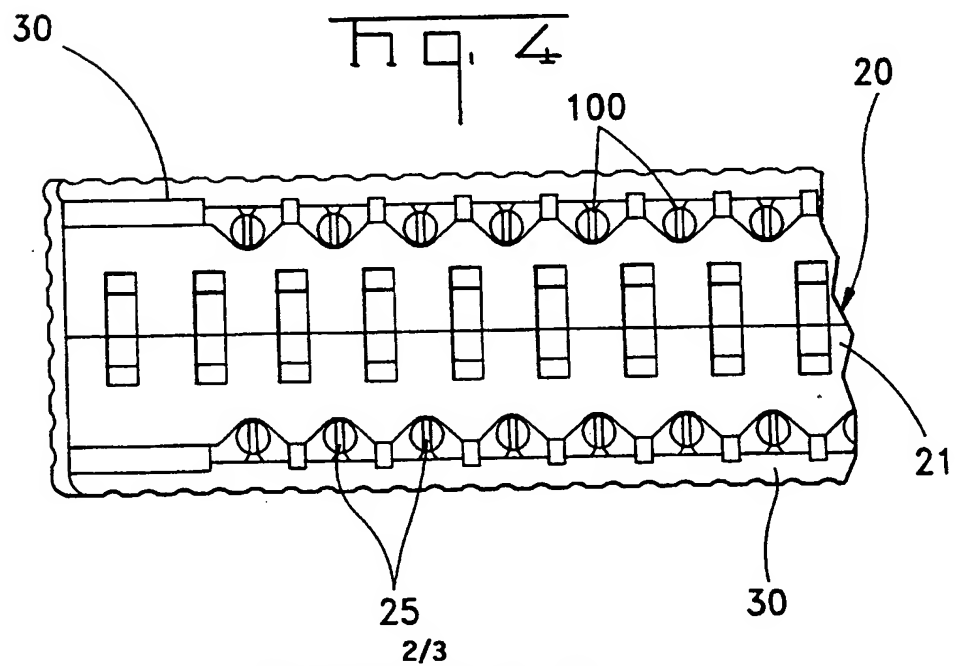
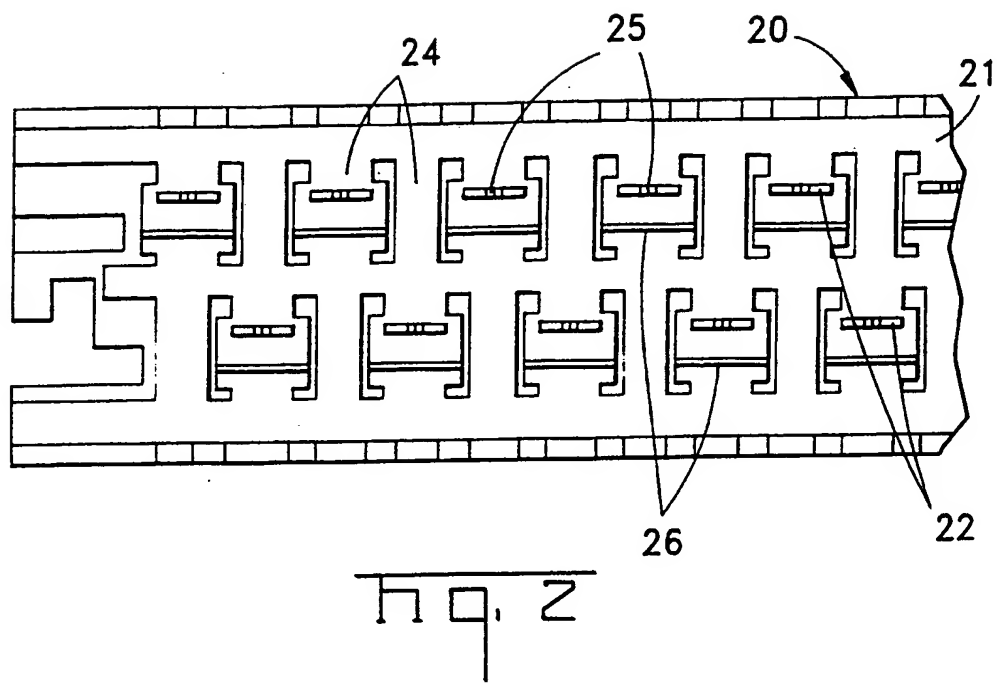
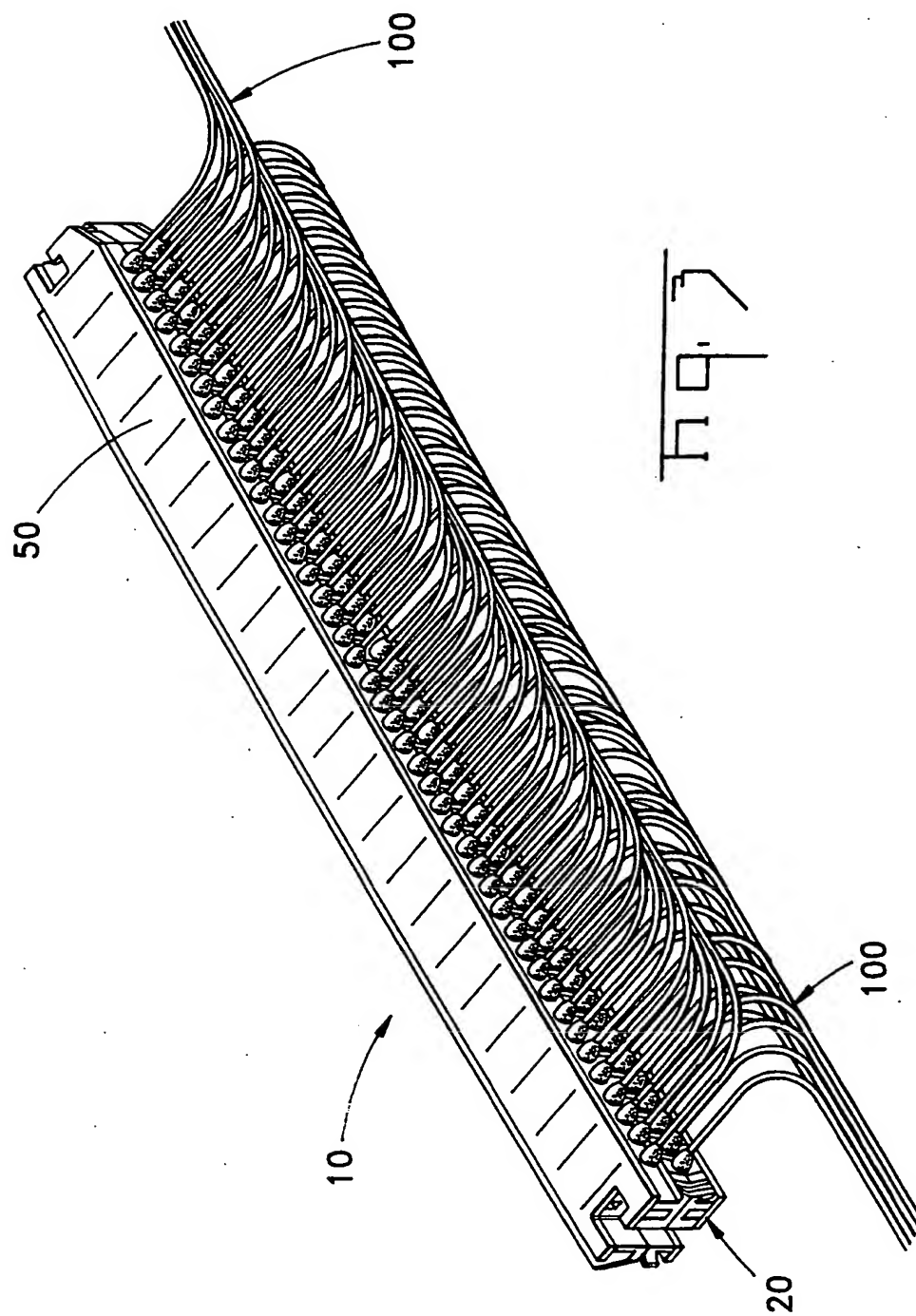


FIG. 1





# INTERNATIONAL SEARCH REPORT

International Application No

PC1/US 96/13380

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 6 H01R13/52 H01R4/70 H01R4/24

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 H01R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US,A,5 360 350 (KOBLOITZ ET AL.) 1 November 1994 cited in the application	1,3
Y	see column 25, line 3 - line 47; figures 12-14	2,5,6
Y	--- DE,C,43 36 849 (WALTER ROSE GMBH & CO KG) 5 January 1995 see column 2, line 58 - column 3, line 24; figures 1,2	2,5,6
A	--- US,A,4 550 220 (KITCHENS) 29 October 1985 see column 4, line 30 - line 37; figures 1,3	3,4
A	--- US,A,4 750 962 (HAYGOOD ET AL.) 14 June 1988 see column 3, line 7 - line 12 --- -/-	1-4

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

### \* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- "&" document member of the same patent family

Date of the actual completion of the international search

15 November 1996

Date of mailing of the international search report

22.11.96

Name and mailing address of the ISA.

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+ 31-70) 340-3016

Authorized officer

Kohler, J

# INTERNATIONAL SEARCH REPORT

International Application No

PCr/US 96/13380

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>US,A,3 923 362 (DUNN ET AL.) 2 December 1975  see column 2, line 27 - column 3, line 2;  figures 2,3  -----</p>	1,5,6

# INTERNATIONAL SEARCH REPORT

information on patent family members

International Application No

PCT/US 96/13380

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A-5360350	01-11-94	US-A- 5354210	11-10-94
		AU-B- 671052	08-08-96
		AU-A- 1644495	15-06-95
		AU-B- 659470	18-05-95
		AU-A- 2103692	25-02-93
		CA-A- 2075309	24-02-93
		EP-A- 0529957	03-03-93
		EP-A- 0708454	24-04-96
		NZ-A- 243569	22-12-94
		JP-A- 7201407	04-08-95
-----			
DE-C-4336849	05-01-95	AU-A- 7998994	22-05-95
		WO-A- 9512235	04-05-95
-----			
US-A-4550220	29-10-85	NONE	
-----			
US-A-4750962	14-06-88	NONE	
-----			
US-A-3923362	02-12-75	NONE	
-----			